

Claims

1. A method for removing deposit from a substrate, wherein deposit that has attached to a main surface of a substrate is removed from the main surface of the substrate using air knife units in which a slit portion is formed so that a fluid can be discharged in band form,

a fluid introduction path having an approximately uniform form in the direction perpendicular to the direction in which a number of air knife units move relative to a substrate is formed between the air knife units and the main surface of the substrate while the air knife units move relative to the substrate, a fluid is discharged toward the fluid introduction path from a slit portion that is formed in the rear portion of said air knife units, and then, passes through the fluid introduction path so as to be led to a wall surface that is formed so as to face the front portion of the air knife units or said fluid, which has the appearance of a wall surface, and furthermore, deposit on the substrate that has deposited on the substrate is led away from the main surface of the substrate, together with said fluid, via a fluid lead-out path which is formed between the air knife units and the wall surface so that the cross section of the flow path is greater than that of the fluid introduction path.

2. The method for removing deposit from a substrate according to Claim 1, wherein the clearance between the air knife units and the main surface of the substrate is adjusted using the Venturi effect between the air knife units and the main surface of the substrate when the fluid passes through the fluid lead-out path, and thereby, the air knife units are supported relative to the main surface of the substrate in such a manner as to fluctuate.

3. The method for removing deposit from a substrate according to Claim 1, wherein the air knife units are paired in the configuration, and in each pair, a fluid that is discharged from the slit portion of one air knife unit has the appearance of a wall surface and a fluid that is discharged from the slit portion of the other air knife is made to collide with said wall surface, and furthermore, said fluid is led away from the main surface of the substrate via said fluid lead-out path.

4. The method for removing deposit from a substrate according to Claim 1, wherein the air knife units are aligned parallel to each other, the rear portion of one air knife unit in each adjacent pair of air knife units is used as a wall surface, and a fluid that is discharged from the slit portion of the other air knife unit is led to said wall surface, and furthermore, said fluid is led away from the main surface of the substrate via said fluid lead-out path.

5. The method for removing deposit from a substrate according to Claim 1, wherein at

least two air knife units of a pair are respectively provided on the two main surfaces, front and rear, of the substrate.

6. The method for removing deposit from a substrate according to Claim 1, wherein deposit on the substrate that has attached to the substrate and is led away from the main surface of the substrate is forcefully captured, together with said fluid, by a capturing means.

7. The method for removing deposit from a substrate according to Claim 1, wherein the fluid that is discharged from the slit portions is a gas for drying a substrate and a liquid for cleaning a substrate.

8. A method for drying a substrate, for removing a liquid that has attached to a main surface of a substrate from the main surface of the substrate using air knife units in which a slit portion is formed, so that a dry gas can be discharged in band form, wherein
a fluid introduction path having an approximately uniform form in the direction perpendicular to the direction in which a number of air knife units move is formed between the air knife units and the main surface of the substrate while the air knife units move relative to the substrate, and a dry gas is discharged toward the fluid introduction path from slit portions which are formed in the rear portion of said air knife units,

next, the dry gas passes through the fluid introduction path and is led to a wall surface that is formed in such a manner as to face the front portion of the air knife units,

said wall surface is formed of a dry gas that is discharged from the slit portion of one air knife unit and a dry gas that is discharged from the slit portion of another air knife unit is led to said wall surface, and furthermore, a liquid that has attached to the substrate is led away from the main surface of the substrate, together with said dry gas, via a fluid lead-out path of which the cross sectional area of the flow path is greater than that of the fluid introduction path and which is formed between the air knife units and the wall surface.

9. An apparatus for removing deposit from a substrate, comprising:

a number of air knife units where a slit portion is formed in the rear portion, so that pressurized fluid can be discharged in band form;

air knife supporting portions for supporting air knife units so that a fluid introduction path is formed between the air knife units and the main surface of the substrate, in such a manner that the width of the gap between these is constant; and

a substrate moving portion for moving an air knife unit and the substrate relative to each other in the direction perpendicular to the direction in which a liquid is

discharged from the slit portion in a state where said fluid introduction path is formed, characterized in that

the air knife supporting portions hold at least a pair of air knife units so that a fluid which is discharged from one slit portion and passes through the fluid introduction path has the appearance of a wall surface and changes the direction of the flow of a fluid which is discharged from the other slit portion to the direction away from the main surface of the substrate, and vice-versa, and thereby, deposit that has attached to the substrate is led away from the main surface of the substrate, together with the fluid, via a fluid lead-out path which is formed between the air knife units and the wall surface and of which the cross sectional area of the flow path is greater than that of the fluid introduction path.

10. An apparatus for removing deposit from a substrate, comprising:

a number of air knife units, where a slit portion is formed in the rear portion, so that a pressurized fluid can be discharged in band form;

air knife supporting portions for supporting the air knife units in such a manner that a fluid introduction path is formed between the air knife units and a main surface of a substrate, so that the width of the gap between these is constant; and

a substrate moving portion for moving the air knife units and the substrate relative to each other in a state where said fluid introduction path is formed, characterized in that

the air knife supporting portions hold a number of air knife units, so that the direction of the flow of a fluid which is discharged from one slit portion and passes through the fluid introduction path is changed to the direction away from the main surface of the main surface by means of the rear surface of another air knife unit, and thereby, deposit that has attached to the substrate is led away from the main surface of the substrate, together with the fluid, via a fluid lead-out path which is formed between the air knife units and the wall surface, and of which the cross sectional area of the flow path is greater than that of the fluid introduction path.

11. The apparatus for removing deposit from a substrate according to either Claim 9 or 10, wherein said air knife supporting portions comprise a clearance adjusting means for adjusting the clearance between the air knife units and the main surface of the substrate using the Venturi effect when the fluid passes through the fluid introduction path.

12. The apparatus for removing deposit from a substrate according to Claim 11, wherein said clearance adjusting means comprises an elastic member for supporting an air knife unit relative to the main surface of the substrate in such a manner as to

fluctuate, and one surface of the air knife unit which faces the main surface of the substrate and forms a portion of the fluid introduction path is a laminar flow creating surface which allows a fluid to pass between the laminar flow creating surface and the main surface of the substrate in a state of laminar flow.

13. The apparatus for removing deposit from a substrate according to either Claim 9 or 10, wherein at least one air knife unit is placed on each of the two main surfaces, front and rear, of the substrate.

14. The apparatus for removing deposit from a substrate according to either Claim 9 or 10, further comprising a capturing means for capturing a fluid which has been led out from the main surface of the substrate along the fluid lead-out path.

15. The apparatus for removing deposit from a substrate according to either Claim 9 or 10, wherein the fluid is a dry gas and the deposit that has attached to the substrate is a liquid.